POLLUTION PREVENTION OPPORTUNITY ASSESSMENT PROTOCOL

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SUBJECT: Pollution Prevention Opportunity Assessment Protocol, 15 October 1994

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PROTOCOL FOR CONDUCTING A POLLUTION PREVENTION OPPORTUNITY ASSESSMENT AT DEPARTMENT OF THE ARMY ACTIVITIES

1. REFERENCES. A list of references is provided in Appendix A.

2. PURPOSE. The purpose of this protocol is to provide guidelines for conducting a pollution prevention opportunity assessment (P2OA) and developing a P2 Plan at Department of the Army installations.

3. GENERAL INFORMATION.

a. Background. Prior to the passage of the 1990 Pollution Prevention (P2) Act (Reference 1, Appendix A), protection of the environment was accomplished through "end-of-pipe" control techniques. While these activities effectively controlled pollution at the point of release, they did not prevent the pollution from ultimately entering the environment. For example, while air pollution control devices removed harmful pollutants from exhaust gases discharged to the atmosphere, they typically collected these pollutants as a solid which was then disposed of via landfill. Thus, while the avenue of introduction was changed, the pollution ultimately was placed back into the environment.

b. Current Philosophy. We now realize that, while pollution control is a necessary part of protecting the public and the environment, we should ultimately be concerned with preventing pollution in the first place. Shifting the media through which the pollution enters the environment is not an acceptable alternative to pollution prevention. Pollution prevention produces positive economic results, reduces long-term liability

and improves the public's perception of the Army. This protocol will assist in conducting P2OA's which are designed to identify those opportunities in which the total quantity of pollution released to the environment can be reduced. This reduction will be accomplished by shifting the focus from "end-of-pipe" controls to source reduction activities.

c. Waste Management Hierarchy. The 1990 P2 Act established a hierarchy for pollution/waste management. (NOTE: Rather than use the cumbersome term "pollution/waste" throughout this document, the two terms will be used interchangeably to refer to hazardous/solid waste generation, air pollution releases and water pollution discharges.) By far the most desirable method of reducing pollution is to prevent its generation. If the pollution cannot be prevented, then all efforts should be made to recycle the pollution. Should prevention or recycling not be feasible then the pollution should be treated in an environmentally safe manner to make the pollution less hazardous to the environment. The final, and least desirable, method for dealing with pollution is to release the pollution directly into the environment (by design or through disposal actions). Release into the environment should only be employed as a last resort and should only be performed in a legal manner.

d. Multimedia Approach. Pollution released (or potentially released) to the environment may do so by way of the three

environmental media (air, water and ground). Pollution prevention activities should assess all three media to ensure that no single media is being improved at the expense of another. A fourth pathway of overriding concern is occupational exposure of workers. Proposed P2 actions must not create adverse occupational health and exposure issues. Conversely, implementation of some P2 actions may reduce worker exposures.

e. Pollutants of Interest. Executive order 12856 (reference 26, Appendix A) placed the emphasis for pollution prevention on the chemicals required to be reported in the Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act (EPCRA) (Reference 28, Appendix A). As a result, the P2OA should focus on these chemicals. However, other chemicals and pollutants may also be considered during the P2OA, such as: the 17 chemicals identified in the 33/50 program (Reference 4, Appendix A), hazardous wastes identified under the Resource Conservation and Recovery Act (Reference 6, Appendix A), the chemicals listed as hazardous air pollutants under the Clean Air Act (Reference 7, Appendix A), the ozone depleting chemicals banned by the Montreal Protocol, and the priority pollutants listed in the Clean Water Act (Reference 8, Appendix A).

f. Executive Order 12856. Executive Order 12856 has committed federal facilities to comply with EPCRA. In addition, EO 12856 established pollution prevention goals for reducing, by

50%, the release and/or off-site transfer of certain chemicals by 1999. The following paragraphs describe these two major portions of the Executive Order in more detail.

(a) EPCRA. This Law can be broken down into four major areas: emergency planning, emergency notification, inventories for chemical storage, and inventories for chemical releases. However, this discussion will be limited to inventories for chemical releases since only this area will directly impact on P2 efforts and goals. Under EPCRA, this section is formally known as the Toxic Release Inventory (TRI) and requires an annual report (known as the Form R) to be submitted to the EPA. All chemicals reported in the Form R, are located on a list of about 300 "TRI chemicals" located in 40 CFR Part 372. A facility must include in its Form R only those TRI chemicals that are manufactured or used at the facility above predetermined quantities. For TRI chemicals that are manufactured (or processed during chemical manufacturing) at a facility, this quantity is 25,000 lbs (per calendar year). For TRI chemicals that are otherwise used at a facility, this quantity is 10,000 lbs (per calendar year). As a result, not all 300+ TRI chemicals will be included in the Form R report. In fact, government-owned, contractor-operated (GOCO) Army installations (which have been reporting since 1989) report an average of 7 TRI chemicals each year. Once a facility has

determined that a TRI chemical must appear on its Form R report, the facility must then make estimates as to how much of that chemical was released into the environment over the past year. These estimates are broken down into air releases, water releases, land releases, off-site transfers (e.g. landfill) , and several other categories. The reported chemicals and their estimated release quantities are updated on an annual basis. Each federal facility must submit its first Form R report by 1 July 1995 which will contain data from calendar year 1994.

(b) Pollution Prevention and 50% Reduction. The reduction goals set by the EO state that only the release of those chemicals that appear on the Form R reports must be reduced by 50% by 31 December 1999. The baseline for this reduction will be calendar year 1994. The EO requires that each federal agency must meet the 50% reduction goal. Therefore, it is the Army as a whole that must meet the requirement rather than each individual Army installation. As a result, it is conceivable that a particular Army installation could show no reduction in its TRI Form R chemicals yet the Army as a whole still attain 50% reduction through P2 measures employed at other Army installations. Although this would be acceptable under the EO, correspondence from the Department of Defense (DOD) states that each DOD facility will be responsible for reducing its own TRI Form R chemicals by 50% by the end of 1999 (Reference 27,

Appendix A). Therefore, each Army installation is committed to use P2 opportunities to reduce the release of its TRI Form R chemicals by 50% over the next 5 years.

(c) Much of the information that must be gathered for the various EPCRA reports can be used by the assessment team. Likewise, if the installation hasn't yet submitted the data required for the EPCRA reports, the P2OA can provide assistance in EPCRA data gathering for the installation. In this case, the P2OA assessment team should coordinate with appropriate officials to ensure that duplication of effort does not occur. In some instances, the EPCRA data gathering and reporting may actually be conducted in conjunction with the P2OA.

g. Phases of the P2OA. The P2OA can be divided into two distinct phases, an installation assessment and detailed process assessments. The instillation assessment is a familiarization and data gathering phase during which the information required to develop a P2 Plan is collected, easily implemented P2 opportunities are identified, and a prioritized list of processes requiring a detailed assessment is established. Easily implemented opportunities are those that already have commercially available solutions (off-the-shelf solutions), relatively low cost with short payback periods, or which have already been implemented at other installations. For processes which require a more extensive evaluation or complex solution, a

detailed assessment may need to be conducted. A discussion of these phases are provided in Paragraphs 4 and 5.

4. INSTALLATION ASSESSMENT. To conduct the installation assessment, a tremendous amount of data must be gathered. Data gathering is one of the most critical elements of the P2OA and should begin prior to going to the field by reviewing all available information.

a. Pre-site Visit Activities. As the assessment team will need a good working knowledge of the wastes being generated at the installation and the processes generating these wastes, a number of activities should be conducted prior to the installation assessment site visit.

(1) Regulatory Review. After the members of the P2OA team have been identified, a thorough review of Federal, State and local regulations should be conducted to identify any site specific requirements related to pollution prevention.

(2) Initial Contact. After becoming familiar with any applicable regulations, the team leader should make initial contact, usually by telephone, with the installation requesting the P2OA. This is a critical event in the process as this contact sets the stage for the working relationship between the team and the installation. Typically this point of contact (POC) is located within the post environmental office. Generally the POC will be the installation environmental coordinator or a

member of the environmental staff. As much of the information to be gathered by the assessment team will come from this office, it is imperative that this working relationship be a good one. An explanation of exactly what is to take place, how long it will take, and what the final product will be should be provided. A brief description of the types of information required from the installation should be provided. Tentative site visit dates should be coordinated at this time, but specific dates may have to wait until after the preliminary information is reviewed and a decision is made on how long it will take to conduct the installation assessment site visit and whether or not a scoping visit is necessary. The initial telephonic contact should be followed by a detailed letter reiterating what is to be done, when and by whom, and spelling out what specific information needs to be provided by the installation (see paragraph 4.a.(4) below).

(3) Points of Contact. A single point of contact (POC) should be identified by the installation to provide the assessment team with direct support during the on-site phase(s) of the assessment. Additional POCs for each waste generator on the installation may also need to be obtained. It is critical that these POCs have extensive knowledge of their ollution sources as well as a good network of contacts so that any additional information requested by the assessment team during

the on-site phase can be obtained expeditiously. While the degree of involvement of the installation POC with the assessment team will vary depending on the quality of the pre-assessment data gathering, they should be dedicated to the assessment team during their stay at the installation.

(4) Tools to be Gathered. To obtain the information required to familiarize the team with the sources of pollution at the installation, a detailed letter should be provided to the installation requesting information prior to the arrival of the assessment team. **The following information should be obtained at least 1 to 2 months prior to the installation assessment to afford the team adequate time to review the materials and develop a plan for conducting the installation assessment (i.e which pollutants and sources should be the team's highest priorities). A scoping visit (see paragraph 4.b) may be necessary to obtain some of this information. The installation assessment should not proceed unless the team has been provided the proper information** and is adequately prepared.

(a) Sources of Pollution. The sources of pollution on the installation along with the types and quantities of these pollutants must be identified before P2 opportunities can be developed. The sources of pollutants should be tracked back to individual building and specific processes. Pollutant generation data should be collected for a complete calendar year, including

one-time or annual maintenance periods when large amounts of waste maybe generated. The following paragraphs briefly discuss the various pollution streams and some of the locations where information on the types and quantities of pollutants might be obtained. Sources of information other than those identified may also be available. Virtually any environmental document may contain pertinent information.

(b) Solid Waste Streams.

i. Hazardous Waste. Information on hazardous waste generation may be obtained from hazardous waste tracking systems (if they exist), DRMO records, hazardous waste manifests, hazardous waste minimization or P2 plans, and hazardous waste minimization or P2 studies.

ii. Infectious Wastes. The quantity of infectious waste generated may be determined by reviewing regulated medical waste records maintained by the Medical Logistics Division or by disposal contractors. Operation logs maintained by on-site treatment facilities, such as incinerators or sterilization units, may also provide infectious waste generation data.

iii. General Refuse. Sources of information on general refuse generation include the installation solid waste management plan, landfill dumping records, and solid waste disposal contracts.

(c) Air Pollution. The primary source of air pollution

emissions can be found in the air emissions inventory. Additional air pollution information can be obtained from air emission evaluation test reports, air permits and permit applications.

(d) Wastewater Sources. Wastewater information can be obtained from NPDES permits, discharge monitoring reports, spill plans, permit applications, and wastewater treatment plant studies.

(e) Materials Procurement. Procurement records for the previous calendar year should be obtained for all of the materials used on the installation which contain any of the chemicals of interest or which are themselves hazardous materials. In addition, procurement records for nonhazardous materials used at the installation which might provide opportunities for reduction or recycling (such as paper) should also be obtained. Procurement records can usually be obtained from the installation logistics organization; however, other procurement organizations may not process acquisitions through logistics (local purchases, self help organizations, morale support, production based acquisitions, etc.) and should be contacted to ensure that all procurement activities are identified.

(f) Utilities. Information on utility usage (water, electricity, etc.) should be obtained to determine if there are

viable opportunities to reduce the utility usage thereby reducing the associated pollution.

(g) Material Safety Data Sheets. Material safety data sheets are a good source of information for identifying hazardous materials or specific chemicals which could be reduced. Information on the composition of materials entering the various processes can be obtained from the MSDS's. However, the information contained on MSDS's may be limited due to proprietary constraints and should be closely scrutinized prior to being used. Specific manufacturers may need to be contacted to obtain more detailed chemical compositions. MSDS's are frequently located in a variety of places: logistics, environmental, preventive medicine, safety, fire department, or at the location the material is used.

(h) Process Descriptions. Information on process descriptions may be found in the mobilization plan, master plan, standard operating practices (SOPs), environmental studies and job order descriptions. A process description worksheet, containing typical information to be obtained, is provided in Appendix B.

(i) Production Schedules. Production schedule informa.on will be required for comparisons with pollution generation records for cyclic operations. In addition, production schedules allow for standardizing pollution

generations so that changes in future production levels do not erroneously indicate increased or decreased pollution generation.

(5) Additional Information. In addition to information discussed above, additional information should also be obtained to assist the team in understanding how the various installation activities relate.

(a) Organizational Charts. An installation organizational chart should be provided to assist the assessment team in understanding how the installation is organized and what the proper chain of command is. Organizational charts for tenant organizations should also be obtained.

(b) Maps. Detailed and legible installation maps should be provided to the assessment team. A minimum of three maps should be obtained so that each media representative may make annotations on their own maps.

(c) Other Information. In addition to the items discussed above, information from hazardous material tracking systems and copies of production shop standing operating procedures could provide the P2OA team with important information.

b. Scoping Visits. If the assessment team is unable to obtain adequate information prior to the detailed assessment site visit, it may be necessary to conduct a scoping visit. The scoping visit may require that one or two members of the

assessment team visit the facility to obtain additional information, gain a better understanding of the operations at the facility and to coordinate the activities of the installation assessment team. The scoping visit should not take the place of the installation assessment. The scoping visit may require quick walk through tours of the larger process on the installation. All tours should be scheduled prior to the scoping visit to ensure that personnel familiar with the processes are available to conduct the tours.

c. Installation Assessment.

(1) Entrance Briefing. An entrance briefing may be necessary to convey to the chain of command and those involved at the installation level what the assessment is and why it is being conducted. The positive results from the assessment (monetary savings, reduced pollution, reduced liability, improved public image, etc.) should be emphasized to get installation and tenant support for the assessment. The installation commander, or a member of the command staff, may want to be briefed. The installation POC is in the best position to query the chain of command and determine at what level the briefing should be presented. POCs for tenant activities and major pollution generators should be included so that they have a full understanding of who will be doing the assessment, why it is being done and to see the command support for the assessment.

Foremen, shift supervisors and senior operators for these activities may also attend the briefing so that they have a thorough understanding of what is going on and why. Production personnel are excellent sources of P2 ideas and should be included in the process as they will be the ones to make the selected P2 opportunities work. During the entrance briefing, the P2OA team should determine if there are any environmental non-compliance issues which could potentially be solved through P2 initiatives. Important occupational exposure issues should also be determined prior to conducting tours of pollution generating activities and processes.

(2) Collection of Additional Information. Collect any additional information or data which the team could not obtain prior to the assessment.

(3) Tours. To facilitate the teams understanding of how pollution is being generated and where it is going, detailed tours of the pollution source should be conducted. The P2OA team should be led on these tours by personnel who have intimate knowledge of how the specific processes work. Unless a specific media is not impacted by a specific source, all three media should be represented during each tour. Shift supervisors, operators and foremen should be interviewed about the pollution generation aspects of their operation. The operation should be toured beginning with the front of the operation (where materials

enter the facility) and should end where the final "product" exits the facility. Each member of the assessment team present during the tour should attempt to take detailed notes on the operation. This will allow the team to compare notes and fill in any data gaps which may exist. Appendix G contains a list of many of the processes likely to be toured and items to consider while conducting these tours.

(4) Guidance Documents and Worksheets. The Environmental Protection Agency has generated a number of P2O guidance documents (References 9 through 25, Appendix A) which contain worksheets that could be helpful during the process tours. Many of these worksheets are industry specific. Assessment team members should review any of these guidance documents which might apply to the installation being visited. In addition, local, State and Federal regulatory agencies should be contacted to see if additional guidance documents are available.

(5) Establishing Priorities. By this time, the assessment team may have adequate information to begin to establish priorities. Priorities are necessary as time and resources are frequently limited, thus the P2OA team must concentrate their efforts on those opportunities which will provide the most benefit. Priorities should not be established without close coordination with installation personnel. The

single most important factor which should be considered when establishing priorities is worker safety. Some additional factors (in no particular order) which should be considered are: regulatory compliance; quantity and toxicity of the pollution being generated; waste management costs; environmental protection; recyclability/recoverability of the waste; ease of implementation; energy requirements; and economics.

(6) Exit Briefing. An exit briefing should be conducted with, at a minimum, the installation POC and the environmental coordinator. Depending on the level of interest, members of the chain of command may also be interested in attending the exit briefing. Exactly who attends the exit briefing should be determined by the installation POC. As no specific information can be disseminated until all P2 options for a particular source have been evaluated, this exit briefing is primarily a courtesy to the installation personnel. The following topics should be discussed:

- The quality of installation and tenant support
- Missing or inadequate information and the date by which the provider has agreed to deliver the information or an explanation of why the data cannot be provided
- A list of the priorities for P2 actions including those that are easily implemented
- A general discussion of the potential P2 opportunities that

the team may have identified but which need a feasibility analysis

- Time lines for the installation assessment report (with a final list of priorities)

- A discussion of the options available to the installation for conducing detailed assessments (DA resources, contractors, etc.)

- Accolades to those individuals and organizations that provided exceptional support.

d. Developing a List of P2 Options. After all of the waste streams have been identified and quantified, a list of P2 options for these streams should be developed. This list is best developed during P2OA team brainstorming sessions during which all proposed options are equal. Option generation should be crganized according to the P2 heiarchy. Source reduction should be considered first followed by reuse/recycle, treatment, and finally disposal. Options can come from other similar facilities, electronic bulletin boards, professional journals, regulatory agencies, etc. Appendix E contains a list hazardous waste producing activities found at many Army facilities and their related waste minimization options.

e. Organizing Process Information. To adequately understand how a process generates pollution, material and energy balances should be developed to organize all of the data (see Appendix B).

Energy balances may be difficult to develop for many Army processes as energy consumption is rarely tracked to the end user. Simple process flow diagrams should be drawn to ensure all influent and effluent streams are being considered.

f. Screening P2 Options. As the option development may have generated many options and the cost of performing a detailed technical, economic and environmental feasibility study for each is prohibitive, the list of P2 options must be reduced to a reasonable number. Screening procedures can range from informal discussions among the team members to using computer programs or electronic bulletin boards.

g. Conducting Feasibility Analyses. Obviously any pollution prevention opportunities which are identified must be economically, technically and environmentally feasible before they should be implemented. Any opportunity which does not pass these feasibility analyses should be dropped from consideration.

(1) Technical Feasibility Analysis. During this analysis, the P2OA team should be determining if the opportunity is technically feasible. Will it actually reduce waste? Will it impact on worker safety? Will product quality suffer? Is there adequate space and resources to implement the opportunity? To determine technical feasibility, the P2OA team may need to contact vendors and organizations currently using a particular piece of equipment, see demonstrations, even arrange for vendors

to install their equipment on a trial basis for evaluation.

(2) Environmental Feasibility Analysis. The environmental evaluation should be conducted to determine if the opportunity actually results in less pollution entering the environment, not just directly from the process, but from all aspects that are affected by the process. When considering the environmental impact of an opportunity, one must remember to include the increased pollution which will occur if more energy is required.

(3) Economic Feasibility Analysis. An economic analysis for each potential P2 opportunity must be conducted. These analyses can be as simple as comparing initial investment to any savings obtained or as complex as total life cycle costing which incorporates not only initial costs and savings, but also maintainability, reliability, disposal and salvage value, training, long term liability, etc. The complexity of the economic analysis will depend on the complexity of the opportunity being proposed. As no single economic analysis method can be used, it will be up to the P2OA team to determine which method should be employed. Many sources of economic analysis information are available (such as Reference 3, Appendix A) and should be used by the P2OA team when conducting economical analyses.

h. Installation Assessment Report. The installation

assessment report should be used to formally establish a prioritized list for conducting detailed P2OA's. This report should provide information on how the prioritized list was developed. Easily implemented opportunities should also be identified and information supporting these opportunities should be included. In addition, a draft P2 Plan, establishing an installation P2 policy, goals, process information, and implementation time lines, should be included. An outline of an installation assessment report is provided in Appendix C, while a draft format for a P2 Plan is provided in Appendix D.

5. DETAILED ASSESSMENT. The following paragraphs describe the process of conducting a detailed assessment should the installation request that the assessment team conduct one or more detailed assessments.

a. Detailed Assessment Site Visits. Detailed assessments for each of the P2 opportunities found on the prioritized list may require additional site visits so members of the assessment team can spend sufficient time observing specific operations to fully understand and evaluate the mechanisms which are generating the pollution. The tour may actually include an extensive observation period during which the team will observe the actual operations for an extended period of time. This will allow the team to determine if particular tasks could be modified to reduce

the generation of pollution. One or more shifts may need to be observed if the activities vary between shifts or if waste generation rates are inconsistent with shift operations. Coordination of these observation periods should be done in advance to ensure that the operations are functioning during the scheduled visit. Coordination should be done with the operation managers. It must be emphasized that operators should not alter their actions just because they are being observed. Stress that P2OA team is there to help them, not place blame or find fault, and that if they change their way of doing things just because they're being observed it will invalidate the data being gathered. A knowledgeable POC should be on hand at the operation to address questions the team may have. Avoid direct discussions with operators (especially if they are contractors) while they are working unless such discussions have been coordinated with the operation POC. Entrance and exit briefings similar to those described for the installation assessment may also be required.

b. P2 Option Development and Screening. The steps in developing and screening P2 options for a detailed assessment are essentially the same as those for P2 opportunities identified during the installation assessment (Paragraphs 4d through 4f).

c. Detailed Assessment Report. The detailed assessment report should be used to formally propose P2O's for the various operations that received a detailed assessment. Depending on the

number of detailed assessments and the time required to complete each assessment, one or more detailed assessment reports may need to be prepared. These reports should provide information on each detailed assessment including: process descriptions, a discussion of how waste steams are generated; the annual quantities of these waste streams and the costs (disposal, treatment, permit fees, etc.) associated with them; the options evaluated; reasons for eliminating certain options; technical, economic and environmental feasibility analyses of any remaining options; and a recommendation on a final option. Appendix F provides an outline for the detailed assessment report.

6. IMPLEMENTATION. The actual implementation of any options developed by the assessment team will generally be the responsibility of the installation though the P2OA team may be involved in the implementation.

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APPENDIX A
REFERENCES

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APPENDIX A
REFERENCES

1. Public Law 101-508, Pollution Prevention Act of 1990, 5 November 1990.

2. U.S. Army Environmental Strategy into the 21st Century, 1992

3. EPA Document No. 600/R-93/059, A primer for Financial Analysis of Pollution Prevention Projects, April 1993.

4. EPA Document No. 560-1-91-003, The Industrial Toxics Project, the 33/50 Program: Forging an Alliance for Pollution Prevention, March 1991.

5. 40 Code of Federal Regulations (CFR) Part 372, Toxic Chemical Release Reporting: Community Right to Know, 1994.

6. 40 CFR Part 261, Identification and Listing of Hazardous Waste, 1994

7. Public Law 101-549, Clean Air Act Amendments of 1990, 15 November 1990.

8. Public Law 100-4, Clean Water Act Amendments of 1987, 4 February 1987.

9. EPA Document, 600/R-92/088, Facility Pollution Prevention Guide, May 1992.

10. EPA Document, 625/7-90/002, Guides to Pollution Prevention - The Printed Circuit Board Manufacturing Industry, 1990.

11. EPA Document, 625/7-91/013, Guides to Pollution Prevention - The Automotive Repair Industry, October 1991.

12. EPA Document, 625/7-90/006, Guides to Pollution Prevention - The Fabricated Metal Products Industry, July 1990.

13. EPA Document, 625/7-91/016, Guides to Pollution Prevention - The Automotive Refinishing Industry, October 1991.

14. EPA Document, 625/7-90/009, Guides to Pollution Prevention - Selected Hospital Waste Streams, June 1990.

15. EPA Document, 625/7-90/010, Guides to Pollution Prevention - Research and Educational Institutions, June 1990.

16. EPA Document, 625/7-90/008, Gui es to Pollution Prevention - The Commercial Printing Industry, 19 0.

17. EPA Document, 625/7-91/014, Guides to Pollution Prevention - Fiberglass Reinforced and Composite Plastics, 1991.

18. EPA Document, 625/7-91/015, Guides to Pollution Prevention - Marine Maintenance and Repair, 1991.

19. EPA Document, 625/R-92/008, Guides to Pollution Prevention - Mechanical Equipment Repair Industry, 1992.

20. EPA Document, 625/R-92/009, Guides to Pollution Prevention - Metal Casting and Heat Treating Industry, 1992

21. EPA Document, 625/R-92/011, Guides to Pollution Prevention - Metal Finishing Industry, 1992

22. EPA Document, 625/7-90/005, Guides to Pollution Prevention - The Paint Manufacturing Industry, 1990.

23. EPA Document, 625/7-90/004, Guides to Pollution Prevention - The Pesticide Formulating Industry, 1990.

24. EPA Document, 625/7-91/017, Guides to Pollution Prevention - Pharmaceutical Preparation, 1991.

25. EPA Document, 625/7-91/012, Guides to Pollution Prevention - Photoprocessing Industry, 1991.

26. Executive Order 12856, Federal Compliance With Right-to-Know Laws and Pollution Prevention, 3 August 1993.

27. Memorandum, U.S. Department of Defense, subject: Implementing Guidance for Executive Order 12856: "Federal Compliance With Community Right-to-Know Laws and Pollution Prevention Requirements".

28. Public Law 99-499, Emergency Planning and Community Right-to-Know Act of 1986.

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APPENDIX B
PROCESS DESCRIPTION WORKSHEET
POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

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PROCESS DESCRIPTION WORKSHEET
POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

[Worksheets may be organized in any format, but should include the following information]

1. Preparation or Revision Date.

2. Operation/Process Name.

3. Location Information.

   a. Building Number(s).

   b. Building Activity.

   c. Activity Standard Procedure Reference Number (e.g., SOP Number, Job Order Number, etc.)

   c. Activity Cost Center.

   d. Point(s) of Contact.

   e. Telephone Number.

4. Overview of Operation/Process. (Describe the operation or process from start to finish as the work flows including type of raw materials used, products produced, and equipment used)

5. Means of Waste Generation. (Describe how and why waste is generated. Describe current disposal practices. Describe any pollution control techniques or equipment used at the source.)

6. Raw Material Usage. (List the following information for all materials related to waste generation. Include any chemicals on the EPCRA Section 313 Toxics Release Inventory list. Also include water consumption and energy usage, if known.)

   a. Raw Material.

   b. Purpose.

   c. Amount Used Per Year. (pounds or kilograms)

   d. Cost Per Year. (Dollars)

7. Hazardous Waste Generation. (List the following information for each type of waste)

a. Waste Description.

b. Waste Quantity Per Year. (pounds or kilograms)

c. Disposal Cost Per Year. (Dollars)

d. Does the waste go to the DRMO or some other contractor?

8. Wastewater Generation. (Determine wastewater flow rate and chemical characteristics to calculate mass of pollutant discharge. List the following information for each wastewater stream)

a. Wastewater Source. (e.g., rinse tank overflow)

b. Total Flow Per Year. (gallons)

c. Chemical Composition. (chemical name and concentration in milligrams per liter)

d. Mass Discharge Per Year. (pounds or kilograms)

e. Disposal Cost Per Year. (Dollars - prorated from total cost of wastewater treatment plant operation)

9. Air Emissions. (List the following information for each type of air emission)

a. Chemical Name or Category.

b. Total Annual Emission. (tons)

c. Pollution Control or Disposal Cost Per Year. (Dollars)

10. Occupational Exposure Issues. (List the following information about each chemical for which unacceptable worker exposure exists)

a. Chemical Name.

b. Exposure Hazard Pathway. (skin, lungs, ingestion)

c. Annual Costs For Reducing Worker Exposure To Acceptable Levels. (Dollars)

11. Mass Balance. (Present in narrative form and attach drawing. Include inputs, outputs, waste, spills, leaks.)

12. Data gaps (Identify any essential information not available and specify a means to obtain it).

13. Pollution Prevention Options (List the following information for each option identified. If suggested by facility personnel, give name)

a. Pollution Prevention Option.

b. Applicable Waste.

c. Impact On Other Media Or Occupational Exposure.

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APPENDIX C
Installation ASSESSMENT REPORT OUTLINE

For the purposes of this protocol, an outline of an Installation Assessment Report is provided with guidance on the type of information which might be included in each section of the report. The report must be tailored to the needs of the installation and must reflect any specific regulatory requirements that must be met. When feasible ***Bold Italics*** have been used to identify sample statements that can be used or modified as necessary within the report.

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APPENDIX C
Installation ASSESSMENT REPORT OUTLINE

1. REFERENCES. A list of references used to prepare the report should be included. Typical references may include Public Laws, CFR's, Federal Registers, records of telephonic conversations, letters, memorandums, guidance documents, etc.

2. AUTHORITY. The "AUTHORITY" paragraph generally contains the references which directed that the project be conducted. These references typically include an AEHA Form 250-R, an "AEHA Schedule of Field Services" memorandum, a record of telephonic conversation, or other "Request for Field Services" memorandums.

3. PURPOSE. The "PURPOSE" of the report should identify why the project was conducted. Generally the installation assessment is being conducted to obtain data for developing a list of pollution prevention opportunities, submitting or updating a Toxic Release Inventory Report and to develop a pollution prevention plan. A typical purpose might be: ***"The purpose of this installation pollution prevention assessment was to collect data for identifying pollution prevention opportunities, update data for the Toxic Release Inventory report, and to develop an installation level pollution prevention plan."***

4. GENERAL.

a. Background. The "Background" section should contain a brief discussion of the installation's mission, its location, and a brief history to familiarize a first time reader with the installation.

b. Regulatory Requirements. This section should address the various regulatory requirements that may be impacted by the assessment report. Federal, state and local regulatory issues should be address as well as any Department of Defense or Department of the Army requirements.

c. Personnel. A list of the personnel conducting the assessment and the personnel contacted, their title or office and possibly their telephone numbers should be included. This provides a permanent historical record for future readers.

d. Chemicals/Materials Considered. A discussion of the various chemicals and materials considered during the assessment should be included. Generally the chemicals or pollutants to be

considered during the P2OA are those chemicals subject to the provisions of the TRI Reporting requirements under the Emergency Planning and Community Right-to-Know Act. Additional chemicals and pollutants which may be considered are: the 17 chemicals identified in EPA's 33/50 program, hazardous wastes identified under the Resource Conservation and Recovery Act, the chemicals listed as hazardous air pollutants under the Clean Air Act, the priority pollutants listed in the Clean Water Act, and chemicals or pollutants required by state or local regulatory agencies. In addition, nonregulated chemicals or waste may be included if there is an overwhelming reason for including them (i.e. they represent a large discharge). A sample statement might be: ***"The chemicals considered during this assessment were those subject to the provisions of the Emergency Planning and Community Right-to-Know Act. In addition, methyl-ethyl-epoxy was included since it represents 60-percent of the pollution discharged from FT XYZ. The following table summarizes the actual list of chemicals found at FT XYZ.***

TABLE. P2OA CHEMICALS

Chemical	*CAS No.*	*Chemical*	*CAS No.*
Acetone	*67-64-1*	*Formaldehyde*	*50-00-0*
Benzene	*71-43-2*	*Ammonia*	*7664-41-7*
Chlorine	*7782-50-5*	*Chromium*	*7440-47-3*
Methyl-Ethyl-Epoxy	*999-99-9*	*Ethylene*	*74-85-1*

e. P2O Prioritization. The mechanism and criteria used to prioritized the P2O's identified in the assessment report should be discussed. These criteria might include: worker safety; regulatory compliance; quantity and toxicity of the pollution being generated; waste management costs; environmental protection; recyclability/recoverability of the waste; ease of implementation; energy requirements; and economics. Also discuss any weighing factors that might have been used.

5. FINDINGS AND DISCUSSION. In the paragraphs that follow, the writer should discuss exactly what took place during the assessment, present any pertinent data that was collected, identify any missing data and what impact that missing information has on the assessment, identify P2 opportunities and discuss the findings of the assessment.

a. Process Descriptions. General descriptions of each process should be provided. Detailed process sheets for each process should be included in an appendix. These process sheets

should describe the type of process, where it is, what it does, how it works, control equipment used and efficiency (if known), and the types and quantities of raw material used/pollutants discharged. Material and energy balances may also be included in the appendix. A list of the personnel in-charge-of and/or interviewed at a particular process should also be included. A sample process description worksheet is provided in Appendix B of this protocol.

b. Summary of Current Pollution/Waste Discharges. A table containing the current annual pollution discharges or waste disposal quantities along with estimated annual costs should be provided. This information will allow reviewers to immediately see which waste streams represent the bulk of the installation discharges and associated costs.

c. Easily Implemented P2 Opportunities. During the installation assessment, the assessment team may identify P2 opportunities that are easily implemented (i.e. low costs with short payback periods, opportunities which have already been implemented at other installations, etc.). For these opportunities, detailed assessments may be unnecessary and they should be identified in the installation assessment report so that the installation can reap the benefits of the opportunity. General discussions of these easily implemented opportunities should be included in the body of the installation assessment report while detailed information (i.e. cost analysis, waste reduction calculations, etc.) would be better located in an appendix.

d. Prioritized List of P2O's Needing a Detailed Assessment. A prioritized list of P2O's which require a detailed assessment to verify technical, environmental and economic feasibility, should be provided. This list should be coordinated with the installation to ensure that the priorities are acceptable. Some of the assessments may be conducted by the P2OA team, while others will be conducted by the installation or some other organization. The prioritized list should indicate who is to be responsible for conducting a detailed assessment. For those being conducted by the P2OA team, a time frame should be established for accomplishing the detailed assessment.

e. Pollution Prevention Plan. This paragraph should introduce the draft pollution prevention plan which is provided in an appendix. A typical statement under this heading might be: *"A draft pollution prevention plan is provided in Appendix ?. This plan incorporates the goals identified in MACOM guidance, a*

generic installation policy statement, and a prioritized list of P2 opportunities. This draft plan can be used to develop a detailed installation level pollution prevention plan as required by Executive Order 12856."

6. CONCLUSIONS. The "CONCLUSIONS" section of the report should be used to summarize the results of the assessment. Topics that might be included in this section include: lack of data availability limited the scope of the assessment; which P2O's should be implemented and which will require a detailed assessment before an implementation determination is made; what level of implementation will be required to achieve the reduction goals; what management practices should be employed to facilitate future P2 efforts. Other topics deemed necessary by the assessment team, the installation or its MACOM, or regulatory agencies should also be included.

7. RECOMMENDATIONS. The "RECOMMENDATIONS" section of the report should contain specific recommendations that the installation should implement. Typical recommendations might include: completing the P2 Plan; initiate the easily implemented P2O's; and coordinating the detailed assessments for the prioritized list of P2O's.

SUBJECT: Pollution Prevention Opportunity Assessment Protocol, 15 October 1994

APPENDIX D
DRAFT POLLUTION PREVENTION PLAN
(NOTE: This will be included as an appendix to the Installation Assessment Report.)

SUBJECT: Pollution Prevention Opportunity Assessment Protocol, 15 October 1994

POLLUTION PREVENTION PLAN
FORT XYZ, SOUTH DAKOTA
XX NOVEMBER 19XX

1. INTRODUCTION

a. Purpose. The "Purpose" of the P2 Plan should identify what the plan is intended to do. A typical purpose statement might be: ***"The purpose of the FT XYZ Pollution Prevention Plan is to identify specific actions designed to reduce the volume and toxicity of the pollution being generated."***

b. Scope. The "Scope" of the P2 Plan should identify which groups of chemicals/wastes/pollutants are covered by the plan as well as any limits on the physical areas of the installation which are being covered. A typical scope statement might be: ***The scope of the FT XYZ Pollution Prevention Plan is limited to the chemicals requiring reporting under EPCRA. In addition, only those processes which introduce these chemicals to the environment are covered."***

c. Background. The "Background" section should contain a brief discussion of the installation's mission, its location, and a brief history to familiarize a first time reader with the installation.

d. Policy. The P2 Plan should contain a "Policy" statement which demonstrates support for P2. A sample policy statement might be: ***"FT XYZ is committed to protecting the environment through the reduction or elimination of the use of toxic substances and the discharge of toxic materials to the environment. All reasonable efforts will be made to prevent pollution from being generated. When pollution generation is unavoidable, we are committed to recycling the pollution. Treatment and disposal will be used only when all other options have been exhausted."***

e. Goals. Attainable pollution reduction goals should be set. These goals should reflect guidance supplied by the Department of the Army, the installation's MACOM, and Federal, state or local regulatory agencies and should focus on he 50% reduction requirements of EO 12856.

f. Updates. Some regulatory agencies or MACOM's may require that the plan be updated on a periodic basis. If such a requirement exists for the installation, this paragraph should

address how often the plan will be updated. A sample statement might be: *"As required by MACOM directive (reference ?), this pollution prevention plan will be updated on an annual basis. Copies of the annual updates will be forwarded to ------ for concurrence."*

2. PROGRAM MANAGEMENT

a. Responsibilities. Program management responsibilities for the various personnel involved in P2 should be identified. Some of these personnel are: Installation Commander; DEH/DSHE; Environmental Coordinator; Logistics; Safety; Preventive Medicine; Environmental Quality Control Committee. Others may be involved as well.

b. Training. The training efforts which will be employed for personnel involved in P2 should also be provided. These training efforts should include formal training courses, as well as informal training sessions and on-the-job training to be provided.

3. PROCESS INFORMATION. General descriptions of each process should be provided. Detailed process sheets for each process should be included in an appendix. These process sheets should describe the type of process, where it is, what it does, how it works, control equipment used and efficiency (if known), and the types and quantities of raw material used/pollutants discharged. Material and energy balances may also be included in the appendix. A list of the personnel in-charge-of and/or interviewed at a particular process should also be included. A set of sample process sheets are provided in Appendix B of this protocol

4. POLLUTION PREVENTION ACTIVITIES

a. Past and Present P2 Activities. All past and present P2 activities should be discussed. Include what the activity was, which processes were impacted, implementation costs, pollution reduction achieved, and what cost savings/cost avoidances were realized. For ongoing projects, discuss implementation schedules and milestones.

b. Future P2 Opportunities. This section will be generated from the detailed opportunity assessments. For each opportunity, a description should be provided and, if available, a detailed discussion of the feasibility analyses (technical, environmental and economic). Implementation time lines should also be included

if they have been established. For those opportunities that have not yet had a detailed assessment conducted, a brief description should be provided and time lines for conduction the detailed assessment should be included.

SUBJECT: Pollution Prevention Opportunity Assessment Protocol, 15 October 1994

APPENDIX E
HAZARDOUS WASTE MINIMIZATION OPPORTUNITIES IDENTIFIED IN 1992 AMC INSTALLATION HAZMIN PLANS

APPENDIX E
POLLUTION PREVENTION OPPORTUNITIES
IDENTIFIED IN 1992 AMC INSTALLATION HAZMIN PLANS

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
PEP WASTES		
TNT Manufacturing	Pinkwater	-Recycle pinkwater during washout of explosive charges from projectiles. This is only applicable for projectiles from which the bulk of explosive has been removed by other means. Washout is restricted to composition B explosives. -Remove explosives from pink water using fabric filters to capture large particles, followed by diatomaceous earth filters for smaller particles and carbon adsorption to remove the explosives. This treatment eliminates placing pink water in surface impoundments. -Install above ground collection tanks from which pinkwater is transported to a pinkwater treatment facility. -Use Ultraviolet Ozonation for pink water treatment. The UV Ozonation destroys the nitrobodies in the explosive contaminated water. This decreases the amount of contaminates and extends the life of the carbon used in wastewater treatment

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
PBXN-106 Manufacturing	Toluene Solvent	-Performing solvent distillation used to support PBXN-106 manufacturing will allow the use of chlorinated solvent to clean explosive residues from tooling and reduce toxicity and flammability hazards to operators. Distillation of explosive contaminated chlorinated solvent is necessary for the final treatment of sludges by open burning.
Munitions Demilitarization	Propellent and Explosive Ash Residue	-Use burning trays for open burning open detonation. -Limit open burning to non-PCP wood scrap/dunnage and PEP contaminated materials only. -Keep each specific chemical formulation of raw waste separate to avoid mixing resultant ash residues that may differ.
	Catch Basin Waste	-Reduce catch basin waste by changing the method of cleaning nutsches. Recover small amounts of material remaining in the nutsches instead of allowing them to be washed into the catch basins.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Munitions Demilitarization (continued)	Catch Basin Waste (continued)	-Reduce catch basin waste in the HMX Nitration Area by implementing a hot acid wash. The hot acid wash is used to remove explosives from the wash tank cloth filters, associated piping, and tank bottoms. This procedure results in less downtime to replace cloth filters which results in less waste explosives.
Explosive waste Management	General	-Search-out potential users for the sale of this material -Use thermal treatment to reduce the volume of the raw waste stream. -Neutralize toxic materials in chemical munitions. -Use chemical stabilization/detoxification to reduce toxicity and allow for the delisting petition of the waste.
	Explosive Contaminated Wastewater	-Reduce volume via dewatering equipment suitable for continued generation of the waste. -Stabilize sludge and prepare delisting petition and/or burn as a fuel supplement.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Explosive waste Management (continued)	Explosive Contaminated Wastewater (continued)	-Search-out potential users for the sale of this material -Use thermal treatment to reduce the volume of the raw waste stream. -Provide better handling and control for melt out into receiving trays. -Increase the explosive content of treatment sludge. This could raise the explosive content to a level that makes the sludge suitable for donor material utilized in the underground detonation disposal operation. -Install kill tank sidewall extensions which neutralize explosive contaminates in the wastewater. However, the kill tanks do not accomplish treatment for lead in the wastewater.
	Explosive Dusts, Removed Explosive Charges, Dewatered Explosive Sludge	-Utilize explosive wastes as an initiator material in the ammunition destruction area.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Explosive Waste Management (continued)	Waste explosives	-Use an Air Curtain Destructor to decontaminate explosive contaminated materials such as paper cardboard and volume reduction of waste. Thermal treatment most often renders the ash non-hazardous.
	Explosive Billets	-Install a Hogmill grinder (to grind explosive chunks generated by the billet splitter operation),a vacuum dryer and related filters, pumps and dust collection system to allow explosive chunks split from reflect billets to be ground into powder for possible reuse or sale.
	Explosive Contaminated Charcoal	-Recycle KO45 explosive contaminated charcoal at off-base contractor.
	Flash Burning Ash	-Replace wood fuel with diesel fuel.
Propellant Waste Management	Propellant	-Use scrap brinding equipment to recycle MK-90 scrap propellant.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Colored Smoke Mixing	Colored/White Smoke, Phosphorus Smoke Wastes	-A Glatt granulator can eliminate acetone as a mixing enhancer. -Recover and reuse dyes from colored smoke mix wastes. -Recover and reuse zinc chloride from white smoke mix wastes.
Incineration	Incineration Ash	-Remove hazardous metal from burning ground ash. -Use Solid/hazardous waste incinerators to reduce ash volumes and toxicity.
	NC Fines	-Recover and reuse NC Fines
Solvent Waste Management	Solvents	-Use a small carbon filter to filter waste solvents containing explosives. The recovered waste solvents can be shipped off-site for use as supplemental fuel in a cement kiln. -Install solvent injection equipment on explosive waste incinerators to treat waste solvents that cannot be recovered by on -site or off-site solvent recovery equipment.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Packaging	Contaminated Packaging Materials & Other Refuse	-Segregate hazardous, explosive materials from non-hazardous materials. -Use recyclable shipment containers for munitions.
CLEANING AND DEGREASING		
Cleaning and Degreasing Operations	Solverts	-Minimize number of solvents to maximize recyclability with solvent recycling equipment. -Recycle spent solvent through purification equipment. -Recycle rinse water. -Identify suitable degreasing solvents replacements such as: CFC replacements, water soluble degreasing compounds (non-chlorinated solvents), or high pressure water systems or spray cabinets. -Use blast media such as bicarbonate of soda to remove grease from parts. -Filter strip tank solvents to extend their use.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Cleaning and Degreasing Operations (continued)	Solvents (continued)	-Use a solvent contractor to supply, reclaim, and recycle solvents. -Identify alternatives by locating and testing water borne cleaners and obtain test data from usage of the selected cleaner in production areas. Waste streams can be re-evaluated for toxicity characteristic data using the Toxicity Characteristic Leaching Procedure.
	Vapor Degreasers	-Replace vapor degreasers with chlorinated solvent(1,1,1-trichloroethane). -A high pressure and or high temperature detergent parts washer may an alternative. -Circulate the vapor degreasing solvent through a recovery still to remove impurities from the solvent. -Use solvents in a vapor degreaser with its own solvent recovery system. -Alkali cleaners are being tested as a solvent substitute.
	Sludge	-Use a distillation unit to recover solvents from degreasing sludge.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
COATING REMOVAL		
Coating Removal	Solvents, Heavy Metals	-Filter strip tank solvents to extend their use. -Use liquid sodium hydroxide instead of powdered sodium hydroxide in paint stripping tanks. -Use abrasive blast media such as steel grit, aluminum zirconium, bicarbonate of soda, carbon dioxide pellets, wheat starch, or plastic media. -For abrasive systems,recover reusable blast media with cyclones. -Use a high pressure water jet system to remove paint coatings. -Adding a binding agent to some types of abrasive media can render the blast residue non-hazardous by limiting the solubility of metals within the residue. -Implement laser stripping or xenon flash lamp stripping. -Routine analysis may show that certain batches of grit blast waste are non-hazardous.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
PAINTING		
Painting	Heavy Metals	-Use lead-free paint.
		-Use chromate-free primer paint(TT-P-664 REV D). This would eliminate potential operator exposure to a liver carcinogen.
	Thinners & Solvents	-Convert to water based paints.
		-Segregate thinners from paint and primer.
		-Recycle solvents used for equipment cleaning.
	Paint Booth Waste	-Introduce a polymer additive to water wall paint booths to detackify and reduce paint booth sludge.
		-For water wall booths, use a flocculent in the paint/water separator.
		-Recycle the water in water wall paint booths.
		-Convert water wall paint booths to dry filter paint booths.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Painting (continued)	Paint Booth Waste (continued)	-Routine analysis of dry paint booth filters may show some filters are non-hazardous. -Implement robotic painting systems to increase precision and reduce waste. -Use high volume/low pressure spray guns to increase transfer efficiency and reduce overspray.
PLATING		
Plating Operations	General	-Install a spray rinse system attached to a transporter hoist that passes over the plating baths. -Implement a reverse osmosis system to reclaim and reuse plating solutions and rinse water. -Implement an electrowinning process where plates collect metals from the rinse waters. This process reduces metals concentration in the rinse water as well as decreasing the raw materials usage since the recovered metals can be reused in the plating bath. -Install a closed loop cooling system to reduce the amount of process water being sent to the IWTP.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Plating Operations (Continued)	General (continued)	-Filter plating solutions to extend their use.
		-Recycle rinse water.
		-Use plating barrels that will prevent small parts from escaping during the plating process. This will result in less contamination to the plating solution.
	Cadmium	-Use aluminum ion vapor deposition to replace cadmium plating for most plating applications.
	Chromium	-Reduce or eliminate chromium wastes by using a chromic acid recycling unit (IONSEP). Zero discharge of chromium can be accomplished with this system.
	Plating Sludge	-Detoxify sludges generated during cleaning of electroplating baths.
METAL WORKING		
Metal Working	Cutting Fluids	-Install equipment to separate and purify water soluble cutting fluids so that they may be reused.
	Coolants (nonhazardous)	-Implement a coolant recovery project. Use filtration to remove impurities to prolong coolant life.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Metal Working (continued)	Forge Compounds (nonhazardous)	-Analyze forging compound waste for possible classification as a non hazardous waste.
	Quench Oils	-Store oils and sell them to a recycler.
VEHICLE MAINTENANCE		
Vehicle Maintenance	Waste Oil	-Refine used oil for reuse or mix it with fuel oil and burn for energy. DRMO or used oil contractors may be capable of this.
		-In states where used oil filters are considered a hazardous waste, drain used oil filters through crushing or gravity.
		-Product substitution using newer synthetic based oils w/longer service life.
	Asbestos	-Collect asbestos residue from brakes in vacuum bags and disposed of by landfilling.
	Refrigerants	-Use a refrigerant collection unit while replenishing/repairing vehicle refrigeration systems.
	Antifreeze	-Use antifreeze recycling equipment to restore spent antifreeze to usable condition.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
HOUSE KEEPING		
	Hazardous Material Procurement and Distribution	-Implement a centralized procurement and distribution system that encompasses all activities on site.
		-Create a list of approved materials and authorized uses.
		-Order only what will be used. Although many materials are discounted for bulk orders, the disposal of unused material can dramatically increase the materials life cycle cost.
		-Limit the number of personnel authorized to pick up hazardous materials from the distribution center.
	Use of Hazardous Materials	-Centralize production activities that are alike. For example locate all painting operations in one area.
		-Implement a hazardous materials and hazardous waste tracking system.
		-Label all containers.
	Personnel Awareness	-Train personnel on recognition, storage, use, and disposal of hazardous materials.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
WASTE DISPOSAL		
Wastewater Treatment	General	-The use of an all polymer system is being studied to replace lime/alum systems.
		-Install a spill containment/surge tank to prevent overflows due to spills or excess rinse water tank discharges.
		-Close unlined evaporation ponds to eliminate groundwater contamination.
	Black Wastewater	-The Iowa Department of Natural Resources determined that the wastewater generated by the waste black powder treatment (water soak) operation is not hazardous and may be used in land application as a fertilizer.
	Sludge	-Install pressure filters and or sludge dehydrators to increase the percent solids in wastewater treatment plant sludge.
		-Sludge segregation. Separate hazardous and non-hazardous streams within the IWTP.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Wastewater Treatment (continued)	Chromium	-Lancy System Chromium Reduction-the Lancy Wastewater Treatment System is for phosphate and chromate waste waters generated from the surface treatment and stripping of metal parts. Hexavalent chromium is reduced to the trivalent form in a batch process. Phosphates and chromates are removed from the water through chemical precipitation. This results in a sludge which can be landfilled.
	Spent Activated Carbon	-Regenerated carbon waste can be used in the carbon filter columns at explosive contaminated wastewater treatment facilities. This will reduce the purchase of new carbon, eliminate treatment of carbon in the explosive waste incinerator and eliminate the disposal of some carbon treated by the explosive waste incinerator as a hazardous waste.
Solid Waste Treatment	General	-Segregate non-hazardous and hazardous waste to reduce volume of hazardous waste disposed. -Dewater toxic and hazardous waste, abstracted liquids can be reused or released into sanitary sewer.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Solid Waste Treatment (continued)	Hazardous Residues	-Preform bench scale testing on solidification methods to be used for treatment of residues that contain toxic concentrations of heavy metals. Also complete the bench scale stabilization work, develop pilot scale methods, and coordinate potential permitting requirements with the regulators.
	Fuel Oil Sludge	-Eliminate excess storage capacity of both aboveground & underground tanks.
		-Consolidate, & burn residues.
	Machine Coolant	-Utilize machine coolant recovery equipment.
	Combustible Waste Oil	-Use filtration to remove dirt and metal constituents from hydraulic oil.
		-Segregate waste oil using above ground storage tanks to improve acceptability for recycling and reuse.
	Water Soluble Oils	-Use a hollow tube ultrafiltration system to make the initial split for coolant recovery.
	Empty HW Drums	-Triple rinse drums that originally contained HW to eliminate a hazardous waste stream.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Solid Waste Treatment (continued)	Phosphate Chips	-Wash and rinse the phosphate chips with fresh water prior to disposal. In this process colloidal zinc phosphate is removed and transferred to the waste treatment plant where they are removed as part of the sludge.
MISCELLANEOUS		
Aerosol Can Disposal		-For disposal of aerosol cans, puncture cans (with proper equipment) and drain liquid. Separate liquids into compatible hazardous wastes and dispose of cans as non-hazardous waste.
Application of Styrofoam Spacers	Methanol	-Substitute isopropanol for methanol as a carrier for an anti-static compound applied to styrofoam spacers. This reduces excessive operator exposure to hazardous vapors during production.
Application of Adhesive Compound	4,4 MDA Adhesives	-Substitute an epoxy-based adhesive for adhesives containing 4,4 MDA.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Pallet Dipping	Pentachlorophenol	-Use automated pallet dipping operations in conjunction with a product change. This reduces toxicity and amount of human exposure.
Refrigeration Maintenance	CFC's	-When performing maintenance on refrigeration systems, trap refrigerants (CFC's) which might be vented to the atmosphere when preforming maintenance on refrigeration systems.
Photography	Silver	-Recover silver from photographic chemicals using electrolytic on-line recirculating units in conjunction with either ion exchange resins or highly efficient metallic replacement cells.
Fueling Operations	Fuel	-Use drip pans under fuel transfer connections.
Machine Coolant System	Spent Coolant	-Extend coolant life using a coolant filtration system. -Use alternative coolants with properties that will improve system operation and coolant life.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Machine Coolant System (continued)		-Pretreat coolants with ultrafiltration. This could reduce waste disposal volume by 80%.
Electrical Maintenance	PCB	-Replace PCB transformers with non-PCB transformers. -Test machinery for PCB contamination before it is sent for disposal. -Conduct frequent inspections and maintenance of PCB equipment.
Metal Finishing	Chromate/Phosphate Waste	-Reduce and precipitate chromates. Precipitate phosphates to form a nonhazardous sludge.
Explosive Vacuum System	Explosive Laden Waters	-Convert wet explosive vacuum systems to dry.
Battery Shop Operations	Battery Acid, Metals	-Recycle batteries through contractor or Defense Reutilization and Marketing Office (DRMO). -Use waste battery acid as pH adjustment for waste water treatment plant batch treatments. -Neutralize battery shop waste and treat it at the sewage treatment plant.

ACTIVITY	WASTE/POLLUTANT	MINIMIZATION OPTIONS
Laboratory Operations	Spent, Used, Expired Chemicals	-Recover and segregate materials. Explosive contaminated non-halogenated solvents can be used as a combustion aid.
Spill Cleanup		-Use sorbet pads and socks in spill response activities rather than clay sorbents to reduce volume of waste.

APPENDIX F
DETAILED ASSESSMENT REPORT OUTLINE

APPENDIX F
DETAILED ASSESSMENT REPORT OUTLINE

1. REFERENCES. A list of references used to prepare the report should be included. Typical references may include CFR's, Federal Registers, records of telephonic conversations, letters, memorandums, guidance documents, etc.

2. AUTHORITY. The "AUTHORITY" paragraph generally contains the references which directed that the project be conducted. These references typically include an AEHA Form 250-R, an "AEHA Schedule of Field Services" memorandum, a record of telephonic conversation, or other "Request for Field Services" memorandums.

3. PURPOSE. The "PURPOSE" of the report should identify why the project was conducted. Generally the detailed assessment is being conducted to evaluate the technical, environmental and economic feasibility of P2O's for a particular process. A typical purpose statement may be: ***"The purpose of this assessment was to evaluate opportunities for reducing the quantity and/or toxicity of the pollution being generated by the ----- process."***

4. GENERAL.

a. Background. The "Background" section should contain a brief discussion of the installations mission, its location, and a brief history to familiarize a first time reader with the installation. A short description of the process being assessed may also be included though a more detailed description will be provided in other paragraphs.

b. Regulatory Requirements. This section should address the various regulatory requirements that may be impacted by the assessment report. Federal, state and local regulatory issues should be addressed as well as any Department of Defense or Department of the Army requirements.

c. Personnel. A list of the personnel conducting the assessment and the personnel contacted, their title or office and possibly their telephone numbers should be included. This provides a permanent historical record for future readers.

5. FINDINGS AND DISCUSSION.

a. Process Description. During the detailed assessment, the assessment team should have developed a thorough understanding of how the process worked. A general description of the process should be provided to document the teams concept of the operation. Detailed process sheets, like those found in Appendix B, should be used to:

describe the type of process; where it is; what it does and how it does it; control equipment used and efficiency (if known); and the types and quantities of raw material used/pollutants discharged. Material and energy balances may also be included, as well as a list of the personnel in-charge-of and/or interviewed at a particular process should also be included.

c. P2 Options Evaluated. During the brain-storming portion of the detailed assessment, the team will develop a list of potential P2O's. Certain P2O's on this list will not be feasible for obvious reasons and can be dismissed. Others will require further study to determine their feasibility. For each of the options, the following information should be provided in the detailed assessment report.

(1) Opportunity Description. A detailed description of each opportunity should be provided so that readers have a good understanding of how the opportunity works.

(2) Feasibility Analyses. A discussion of the technical, environmental and economic feasibility of each opportunity should also be discussed. Weighted criteria should be developed to compare the various options. A table comparing each option should be generated to logically compare the various options.

6. CONCLUSIONS. Typically the "CONCLUSION" section should specify which option is considered to be the most viable. However, after the feasibility analysis is completed, the conclusion might be that no viable option exist.

7. RECOMMENDATIONS. The recommendation of the Detailed Assessment Report should be to implement the viable option or, if none exists, to do nothing.

SUBJECT: Pollution Prevention Opportunity Assessment Protocol, 15 October 1994

APPENDIX G
PROCESS TOUR CONSIDERATIONS

APPENDIX G
PROCESS TOUR CONSIDERATIONS

The following paragraphs discuss some of the items which should be considered while conducting process tours at Army facilities. The list of operations is not intended to be all inclusive nor are the considerations identified the only ones which should be considered.

1. PAINTING OPERATIONS

   a. What type of paint is being used? (water-based, solvent-based, single component CARC, duel component CARC).

      (1) If solvent-based, is it possible to use a water-based paint w/o affecting the product?

      (2) If double component CARC, is it possible to use a single component CARC?

   b. What type of paint thinner is being used?

      -Is it possible to use a less hazardous thinner?

   c. What type of paint booth is being used? (dry filter or water curtain)

      (1) Dry Filter:

      -How often are filters changed?
      -How are filters disposed of?
      -Have the filters been tested and if so, do disposal methods correspond with the test results?

      (2) Water Curtain:

      -Is the water recirculated through the paint booth or is it continuously drained?
      -If drained, where does it go? has it been tested?
      -If recirculated, how often is the booth cleaned out? How is it cleaned out? How is the sludge disposed of?

   d. How is the painting equipment cleaned after use?

      -What type of waste does this process generate?
      -How is the waste disposed of?

e. Do the painting operations incorporate any of the following P2 opportunities:

-Pot liners
-Solvent stills and/or solvent filters
-High volume, low pressure painting

2. PAINT REMOVAL

a. What type of coatings are being removed?

b. What types of surfaces are being stripped?

c. What is the coating removal process being used? (chemical or abrasive)

(1) Chemical:

-What chemical(s) is(are) being used in this process?
-How are the chemicals applied to the surface?
-How long do the chemicals remain on the surface?
-How are they removed from the surface?
-How and where are the chemicals contained after removal from the surface?
-Can the chemicals be reused for future coating removal operations or must they be disposed of after their initial use?
-How are the chemicals disposed of?
-Would changing to an abrasive coating removal process be feasible?
-What efforts would be required to implement an abrasive coating removal operation?

(2) Abrasive:

-Is abrasive coating removal performed in an enclosed environment or in the open?
-What type of abrasive media is being used?
-Have there been any considerations to use a tougher, longer lasting media?
-Do the media particles get used one time before being discarded or are there any mechanisms in place to collect and recycle reusable media particles?
-If using water, sodium bicarbonate or wheat starch media, are there any mechanisms in place to separate the spent blast media from the coating particles?
-What hazardous constituents (if any) are present in the blast residue?
-How is the blast residue being disposed of?

3. CLEANING AND DEGREASING

a. What type of parts/equipment are being cleaned?

b. What material is being removed form these parts/equipment? (oil, grease, dirt, etc.)

c. What kind of cleaner is being used? (solvent, detergent, water)

d. What type of waste is generated from this process? How much is generated?

e. How is the cleaner/degreaser being applied(in a solvent/ detergent bath, vapor degreaser, recirculating sink, enclosed parts washer, other)?

(1) Solvent Bath:

-How are parts placed in and removed from the solvent bath?
-Are there any means to prevent solvent from dripping off of the parts and onto the floor once they are removed from the bath.
-What mechanisms are in place to slow the solvent's evaporation (lid, floating balls, other)?
-How often is fresh solvent added to replace solvent that has evaporated?
-How often is the tank drained and cleaned? How is this procedure performed?
-Are there any means of removing dirt, oil, and grease from the solvent bath in order to extend the life of the solvent or detergent in the bath.

(2) Vapor Degreaser:

-How are parts placed in and removed from the degreasing vat?
-Are there any means to prevent solvent from dripping off of the parts and onto the floor once they are removed from the bath?
-How often is fresh solvent added to the vat to replace solvent lost as a result of evaporation or drippage?
-How often is the tank drained and cleaned? How is this procedure performed?

(3) Recirculating Sink:

-Who owns and maintains the solvent and solvent sinks (facility, installation, or contractor)?

-How often are the solvent sinks serviced?
-What is done with the used solvent?
-Adequacy of the service schedule....when solvent in sink is replaced, is the solvent:
...so dirty that it has not been able to effectively clean parts?
...so infrequently used that the solvent is barely dirty or not dirty at all?
...just to the point where it is becoming dirty and in need of a change?

(4) Enclosed Parts Washing Units:

-How many times can the solvent or detergent in these units be reused before being removed as a result of becoming too dirty to be effective?
-Are there any mechanisms in place to remove oils and dirt from the solvent/detergent solution to extend the life of the solution?

f. Have any of the following P2 opportunities been considered:

-Solvent substitution
-Use of hot water and detergent parts washers
-Solvent reclamation through distilling or filtering

4. VEHICLE MAINTENANCE OPERATIONS

a. What types of vehicles are maintained here?

b. What type of maintenance is performed? (routine servicing, body work, engine rebuild, vehicle washing...)

(1) Routine Servicing:

(a) Antifreeze:

-What is done with antifreeze once it has been removed from the vehicles?
-Has spent antifreeze been tested for any hazardous constituents (lead is common)?
-Is spent antifreeze recycled or disposed of?
-If disposed of, how is this done?
-If the antifreeze is recycled, what type of antifreeze recycling machine is being used?
-Is the recycling machine able to restore spent antifreeze to the proper MIL spec?

(b) Used Oil:

-What is done with used oil once drained from vehicles?
-Is the used oil tested for hazardous constituents?
-What procedures are followed to clean up oil spills and drips?
-If adsorbents are used, what kind?
-Are they reused for future clean-ups or disposed of after each clean-up?
-How are oil-soaked adsorbents disposed of?

(c) Used Oil Filters:

-Are used oil filters drained before disposal?
-If so, how and for how long? What is done with the oil drained from filters?
-Are any used oil filters terne-plated?
-If so, how are they disposed of?
-How are non-terne plated oil filters disposed of?

(2) Body Work:

-What is done with any scrap metal generated as a result of body work?
-Are any adhesives used?
...What type?
...How much?
...How is excess adhesive disposed of?
-Are painting operations performed? If so, see painting section above.
-Are paint stripping operations performed? If so, see coating removal section above.

(3) Engine Rebuild:

-Do any machining procedures take place to support rebuild operations?
-Are solvents/detergents used to clean or degrease parts? If so, see cleaning/degreasing section above